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[研究文章 Research Article]

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Notes on Small-Scale Sleeping Aggregation in *Sallya madagascariensis* (Boisduval, 1833) (Lepidoptera : Nymphalidae)

HAN-YU LIN

Department of Biology, National Changhua University of Education, Jin-De Campus, Address: No.1, Jin-De Road, Changhua 500, Taiwan (R.O.C.). Email: hanyuulin@gmail.com

Abstract: Sleeping behavior is poorly documented in Lepidoptera, not to mention sleeping aggregations. In this study, I report for the first time the sleeping behavior of *Sallya madagascariensis* (Boisduval, 1833), a rare Nymphalidae species found in Madagascar. Notably, we observed that individuals of this species exhibit aggregation behavior during their nighttime resting periods. They were found resting on the undersides of leaves in a vertical position, typically at a height of three to four meters on the tree.

Key words: *Sallya*, Nymphalidae, sleeping aggregation, nighttime ecology, night roosting, Madagascar

Introduction

The aggregation of insects is a spatial arrangement unit, typically occurring when the number of individuals is greater than or equal to three (Parrish and Hamner, 1997; Mallet et al., 1987; Mallet, 1980). Many studies on butterfly aggregations have focused on overwintering behaviors, such as the overwintering clusters of *Danaus plexippus* (Linnaeus, 1758) in the Americas (James & James, 2019) and *Euploea* spp. in Taiwan (Yang et al., 2008). Although there are some records of their sleeping behaviors during the night, research on the nighttime ecology of other butterflies in relation to their overnight behavior is relatively scarce (Rau, 1916; James, 2019; Davis et al., 2012; Chao, 2008). The term 'sleep behavior' refers to the phenomenon where butterflies remain motionless in their resting positions during the night and continue to occupy their original habitats until the following day (Rau and Rau, 1916; Salcedo, 2011). *Zizina otis riukuensis* (Matsumura, 1929) and *Zizeeria maha okinawana* (Matsumura, 1929), both belonging to the family Lycaenidae, are reported to sleep aggregately (Chang et al., 2020). Some species of *Heliconius* (Nymphalidae) also exhibit similar sleeping aggregation behaviors (Mallet, 1986). In *Heliconius*, it has been observed that collective clustering facilitates anti-predator attacks (Finkbeiner, 2019). Unpalatable *Heliconius* butterflies enhance the effectiveness of their aposematic signals when in aggregations (Finkbeiner et al., 2012). The benefits provided by these aggregation behaviors include foraging advantages (Dall, 2002) and a reduction in predation risk (Merke and Mosbech, 2008).

The members of *Sallya* Hemming, 1964 (Nymphalidae) are distributed in Africa and Madagascar. The type species, *Sallya madagascariensis* (Boisduval, 1833), also known as the Malagasy Swallowtail, is primarily found in the forests of Madagascar (Lees et al., 2003). Limited information and ecological research are available on the Malagasy Swallowtail, and it was considered a rare species (Boisduval, 1833). The sleeping behavior has never been recorded in the genus *Sallya* to date. Here, I provide the first record of nocturnal sleeping behavior and aggregation in *S. madagascariensis*.

Materials and methods

This study utilized a Canon R5 digital SLR camera paired with a Canon RF100-500mm f/4.5-7.1L IS USM lens and a Yongnuo YN500EX flash for photography. Additionally, an iPhone 14 Pro was used in the study.

Results

Sallya madagascariensis (Boisduval, 1833)

Observations of *Sallya madagascariensis*: The sleeping behavior of *S. madagascariensis* was observed in the Kirindy Mitea National Park, located in the Menabe region of western Madagascar. On May 12, 2023, a group of *S. madagascariensis* butterflies was found sleeping upside-down on the undersides of leaves approximately 3 to 4 meters high on a tree at 00:12. There were a total of six individuals, with four of them perched on the same leaf, while the other two were resting on separate leaves (Fig. 1, A, B). On the following day, one of them was no longer present at the location at 7:10, but the others continued staying on the original leaf (Fig. 1, C, D). During the leaf-shedding period of the dry season, there were just a few poor leaves on the tree, making it difficult to identify the species of the perching plant (Fig. 2).

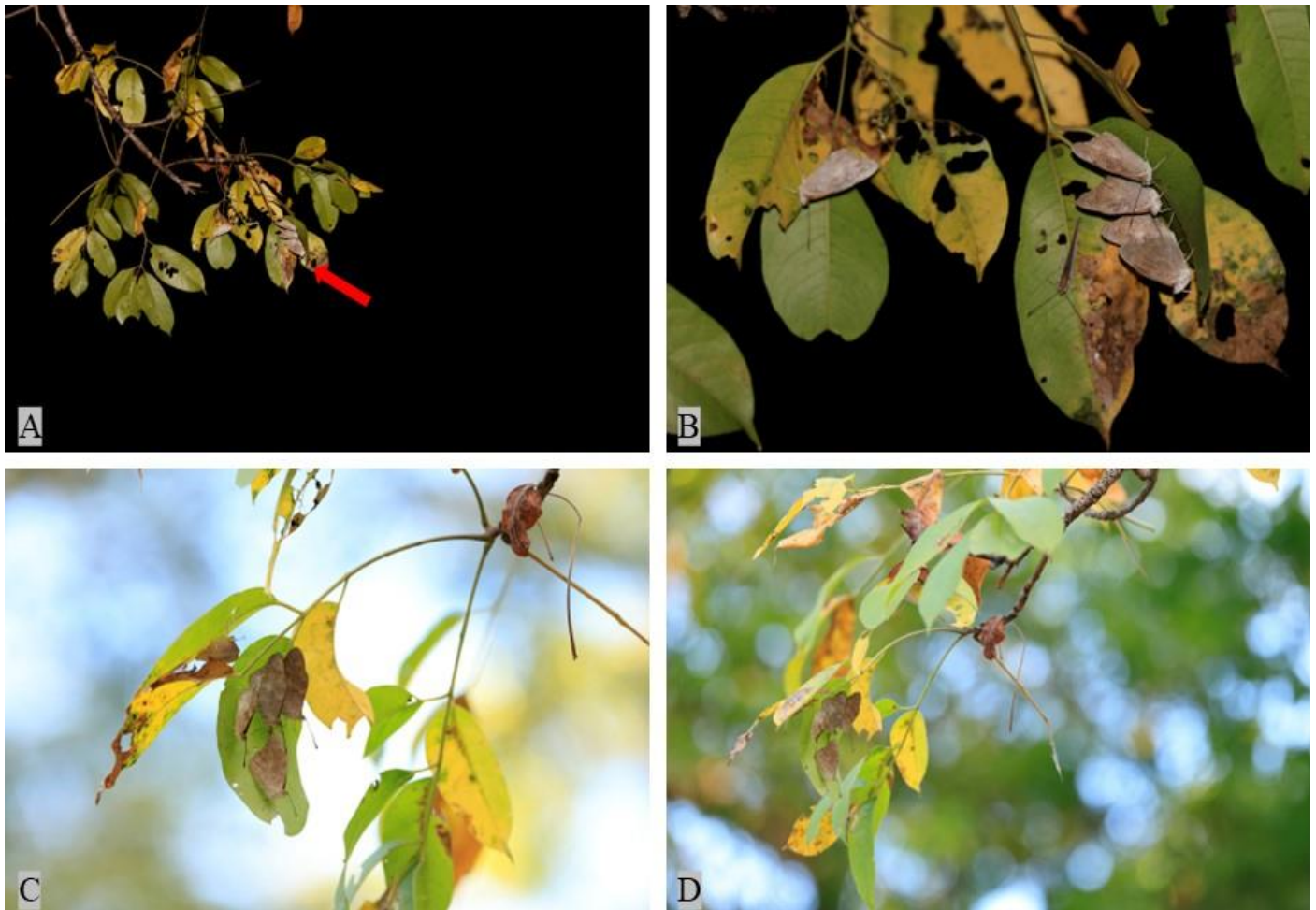


Figure 1. *Sallya madagascariensis* (Boisduval, 1833): (A) Perching locations of adult butterflies during nighttime sleeping; (B) Nocturnal aggregation of six individuals resting on the undersides of leaves; (C) Observations of five individuals the next morning; (D) Minimal variation in perching locations of adult butterflies during the daytime.

Discussion

Sleeping aggregation primarily occurs in certain unpalatable species of the subfamilies Acraeinae, Danainae, and Heliconiinae within the family Nymphalidae (Owen and Chanter 1969; Rau 1916; James 2019; Davis et al. 2012; Chao 2008; Mallet 1986). The *Acraea encedon* (Acraeinae) is found to roost aggregately at night in the same area for up to one to two months (Owen and Chanter 1969). On the other hand, *Danaus plexippus* (Danainae) is a typical case of overwintering and sleeping aggregation (Rau 1916; James 2019; Davis et al. 2012). They maintain aggregation behaviors, including sleeping aggregation, at various times, similar to the overwintering behavior of *Euploea* spp. (Danainae) in Taiwan (Chao 2008). However, it is unclear whether *S. madagascariensis* is unpalatable to predators. Among them, *Heliconius* spp. (Heliconiinae) often choose to cluster for dormancy on drooping branches. The overwintering *Arhopala paramuta horishana* (Matsumura 1910) clusters aggregate on concealed dry leaves on the tree (Lin 2020). Many butterflies typically rest individually during sleep. For example, *Pontia protodice* (Boisduval & Leconte 1830) (Pieridae) often sleeps on parts of *Eupatorium* sp. (Asteraceae) stems that still have seeds (Rau and Rau 1916). *Anthocharis cardamines* (Linnaeus 1758), on the other hand, settles on the inflorescences of *Anthriscus sylvestris* (L.) Hoffm. 1814 (Apiaceae) and *Alliaria petiolata* (Matsumura 1910) to decrease the chances of being detected by potential predators (Courtney and Duggan 1983). I speculate that the resting appearance of *S. madagascariensis* may exhibit functional camouflage or crypsis, similar to the case of *Anthocharis cardamines*. However, *S. madagascariensis* exhibits a distinct behavior of forming sleeping aggregations, setting it apart from *A. cardamines*.

While I have not personally observed the daytime behavior of *S. madagascariensis*, it can be inferred from iNaturalist data that *S. madagascariensis* is likely to be primarily solitary in its activity (<https://www.inaturalist.org/taxa/1114488-Sevenia-madagascariensis>). Notably, there remains a scarcity of research in the field of nocturnal ecology, particularly regarding butterfly sleeping behavior. Therefore, this study aims to fill this research gap by documenting the nighttime sleeping and sleeping aggregation behavior of *S. madagascariensis*. The findings of this study will provide crucial biological information and contribute to the understanding of butterfly nighttime ecology.



Figure 2. Only a few leaves remain on the tree, and the resting place for adult insects is on the underside of the leaves marked in red.

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馬達加斯加星蛱蝶睡眠群聚行為之短記 (鱗翅目：蛱蝶科)

林翰羽

國立彰化師範大學生物學系 500 彰化縣彰化市進德路 1 號 Email: hanyuulin@gmail.com

摘要: 鱗翅目的睡眠行為較少被觀察與記錄，尤其是群聚的睡眠行為。本文首次觀察記錄到馬達加斯加星蛱蝶 (*Sallya madagascariensis* Boisduval, 1833) 在睡眠時表現出群聚行為，這是在馬達加斯加罕見的蛱蝶科物種。值得注意的是，此次觀察到該物種的個體在夜間休息期間表現出聚集行為，並發現牠們通常以垂直的姿勢停棲在葉子的底面，停棲的樹高度約為 3 至 4 公尺。

關鍵字: 星蛱蝶、蛱蝶科、睡眠群聚、夜間生態學、夜間棲息、馬達加斯加

[研究文章 Research Article]

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Record of the Reptile Tick *Amblyomma helvolum* Koch, 1844 (Ixodidae: Amblyomminae) Collected from Sorsogon Province (Luzon Island), with a List of Squamate Hosts in the Philippines

ACE KEVIN S. AMARGA^{1, 2, 3}

¹ Biodiversity Program, Taiwan International Graduate Program, Biodiversity Research Center, Academia Sinica, Nangang District, Taipei 11529, Taiwan. Email: ace_amarga061@yahoo.com

² School of Life Science, National Taiwan Normal University- Gongguan Campus, Wenshan District, Taipei 11677, Taiwan.

³ International Union for Conservation of Nature Species Survival Commission (IUCN SSC) Parasite Specialist Group.

Abstract. *Amblyomma helvolum* Koch is a reptile-associated bont tick native to the Oriental and Australasian regions. This account reports host records of *A. helvolum* collected during the 2017 herpetological expedition in Sorsogon province. In addition, tick specimens from a dead king cobra collected in 2023 were included representing the first record of *A. helvolum* parasitizing *Ophiophagus hannah* (Elapidae) in the Philippines. Also, this paper represents the first published account of reptile-associated tick collected in Sorsogon province, Luzon Island, the Philippines. An updated list of squamate hosts of *A. helvolum* in the Philippines is also provided.

Keywords: Bicol, Ixodida, Reptilia, Sorsogon

Introduction

Sorsogon is located at the southern portion of the Bicol Peninsula and is considered the southernmost province on Luzon Island. Its mountainous terrain and remaining forests serve as the home to a variety of native and endemic species of flora (Pelser et al., 2023). Additionally, Sorsogon is home to several Philippine endemic herpetofauna such as *Gonocephalus sophiae* (Gray), *Limnonectes woodworthi* (Taylor), and *Tropidophorus grayi* (Günther) (Binaday et al., 2017). On the other hand, reptile-associated ectoparasites, especially ticks in this province, are poorly known. This account represents the first published record of reptile-associated *Amblyomma* in Sorsogon province.

Materials and methods

On 23 January to 05 February 2017, a herpetological expedition was conducted in Barangay Cawayan, Irosin municipality, Sorsogon province, Luzon Island, Philippines (12.70141°N, 124.07820°E). Collected reptiles were thoroughly examined for the presence of ticks which were carefully removed using fine-tipped forceps and preserved on vials containing 95% ethanol. Additional specimens collected in 2023 from a juvenile dead king cobra by a local resident were also included. Tick specimens were examined using Leica S9D stereomicroscope. Following the descriptions provided by Voltzit & Keirans (2002), the specimens were identified as *Amblyomma helvolum* Koch, a reptile-associated tick inhabiting the Oriental and Australasian region.

Results

Order Ixodida
Superfamily Ixodoidea
Family Ixodidae
Subfamily Amblyomminae
Genus *Amblyomma*

Amblyomma helvolum Koch
(Figure 1A)

Material examined. PHILIPPINES: LUZON: On *Tropidophorus grayi* (RMB 23124, 23125, 23190): 1♂, 1♀, Brgy. Cawayan, Irosin municipality, Sorsogon province, 01-II-2017, coll. AK Amarga; 2♂♂, 1♀, same loc., 04-II-2017, coll. AK Amarga; On *Ptyas luzonensis* (RMB 22780): 1♂, 1♀, Brgy. Cawayan, Irosin municipality, Sorsogon province, 01-II-2017, coll. AK Amarga, On *Varanus dalubhasa* (RMB 23077, 23079): 10♂♂, 10♀♀, Brgy. Cawayan, Irosin municipality, Sorsogon province, 03-II-2017, coll. AK Amarga; On *Ophiophagus hannah*: 1♂, 2 nymphs, Brgy. Magsaysay, Bulan municipality, Sorsogon province, VIII.2023, local collector.

Amblyomma helvolum is a widespread polyxenous reptile tick recorded in several countries in mainland Southeast Asia, including Indonesia, the Philippines, Taiwan, and Timor Leste (Petney et al. 2019; Oda et al. 2023; Amarga et al. 2022, 2023; Amarga & Lin 2023). The primary host group of *A. helvolum* is squamate reptiles, and it is rarely recorded on mammals and testudines. Recently, Kwak et al. (2023) reported the first case of human infestation. Additionally, *A. helvolum* is known to co-occur with other ecologically sympatric tick species, utilizing the same host (Amarga & Robbins 2023). In the Bicol Peninsula, accounts of *A. helvolum* and its associated hosts were first reported by Auffenberg (1988) based on specimens collected in Camarines Sur province. Subsequently, Amarga et al. (2022) documented *A. helvolum* in Albay province. This documentation is the first record of *A. helvolum* in Sorsogon province.

Furthermore, the recorded squamate host species in the Philippines for *Amblyomma helvolum* are as follows: *Dasia grisea* (Gray tree skink), *Eutropis multifasciata* (Many-lined sun skink), *Gonocephalus sophiae* (Negros forest dragon), *Hydrosaurus pustulatus* (Philippine sailfin lizard), *Lycodon capucinus* (Common wolf snake), *Malayopython reticulatus* (Reticulated python), *Otosaurus cumingii* (Cuming's sphenomorphus), *Ptyas luzonensis* (Smooth-scaled mountain rat snake) (Figure 1B), *Tropidophorus grayi* (Gray's keeled skink) (Figure 1C), *Varanus dalubhasa* (Enteng's monitor lizard) (Figure 1D), *V. mabitang* (Panay monitor) *V. marmoratus* (Marbled water monitor) *V. nuchalis* (Large-scaled water monitor) *V. olivaceus* (Gray's monitor) *V. palawanensis* (Palawan water monitor). In addition, due to its polyxenous nature and widespread geographic distribution, *A. helvolum* is also expected to be ectoparasitic on other Philippine native squamates.

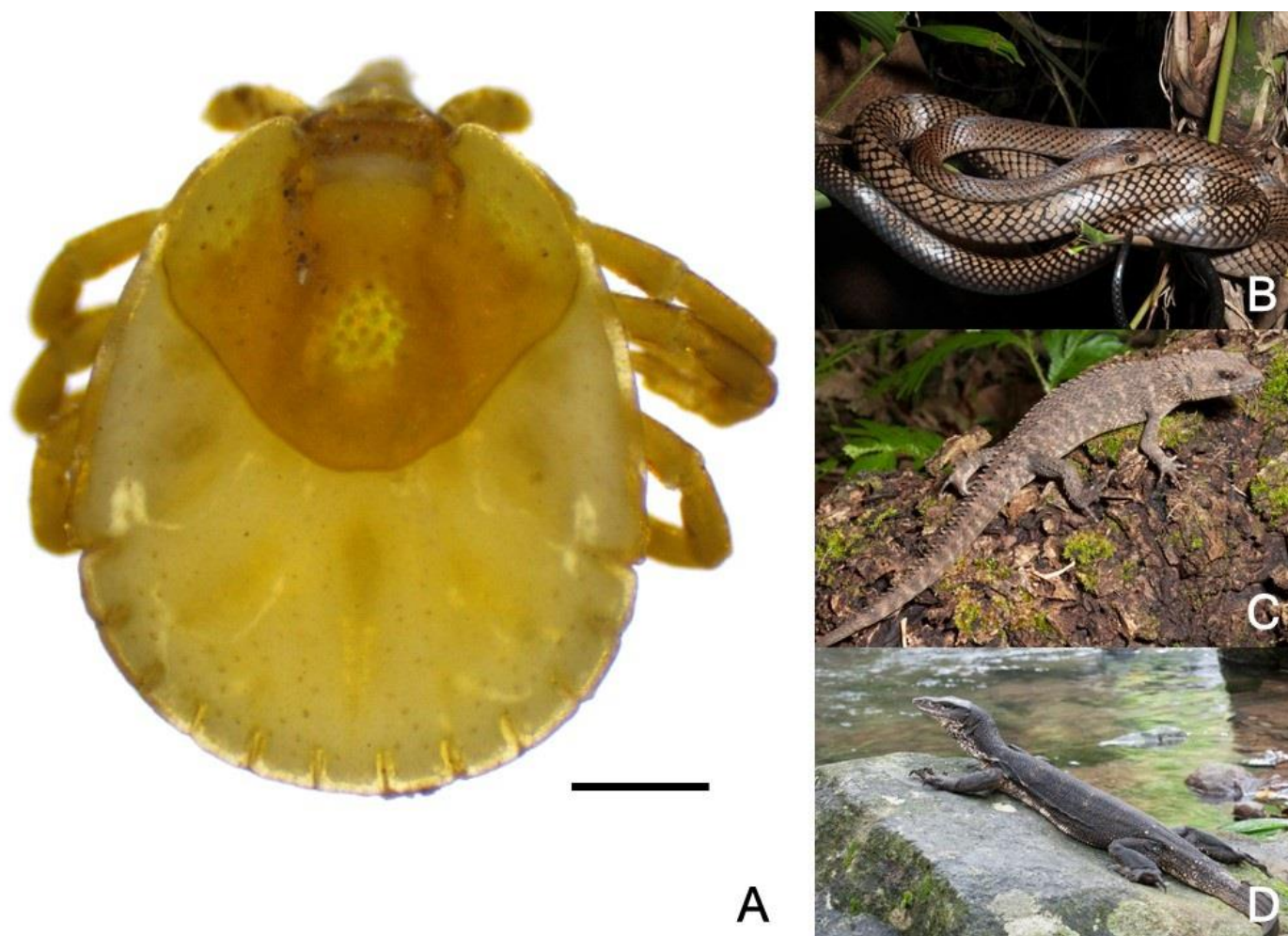


Figure 1. *Amblyomma helvolum* (A, dorsal view, unengorged ♀; scale= 1mm) and its reptile hosts collected during the 2017 expedition: (B) Smooth-scaled mountain rat snake (*Ptyas luzonensis*), (C) Gray's keeled skink (*Tropidophorus grayi*), and (D) Enteng's monitor lizard (*Varanus dalubhasa*). Host images were provided by Dr. Rafe Brown (Kansas University).

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寄生於爬蟲類的南蛇花蜱（硬蜱科：花蜱亞科）之索索貢省（呂宋島）紀錄，與菲律賓的有鱗目宿主列表

艾斯^{1, 2, 3*}

¹ 中央研究院生物多樣性中心 生物多樣性臺灣國際研究生博士學位學程 11529 臺北市南港區

E-mail: ace_amarga061@yahoo.com

² 國立臺灣師範大學生命科學專業學院 11677 臺北市文山區

³ 國際自然保護聯盟物種存續委員會（IUCN SSC）寄生蟲專家組

摘要：南蛇花蜱(*Amblyomma helvolum* Koch) 是一種與爬蟲類相關的硬蜱，分佈於東方和澳洲地區。本文報告在 2017 年菲律賓呂宋島索索貢省爬蟲類調查期間收集的南蛇花蜱宿主紀錄，與首次發表在索索貢省與爬行動物相關的蜱蟲的紀錄，包含 2023 年收集的寄生於眼鏡王蛇 (*Ophiophagus hannah*) 的蜱標本，為菲律賓首次紀錄。此外提供菲律賓的南蛇花蜱之有鱗目宿主列表。

關鍵詞：比科爾、真蜱目、爬蟲類、索索貢



[研究文章 Research Article]

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Checklist of Taiwanese Proctotrupidae (Hymenoptera: Proctotrupoidea), with Nine New Records

JUNTA ABE

Entomological Laboratory, Faculty of Agriculture, Kyushu University, Japan.

Corresponding author: ff.my.j.r@gmail.com

Abstract. A checklist of the Taiwanese fauna of Proctotrupidae was provided. Nine species of Proctotrupidae were newly recorded from Taiwan: *Brachyserphus abruptus* (Say, 1836), *B. leleji* Kolyada, 2016, *B. nudipleuralis* Kolyada, 1997, *B. parvulus* (Nees, 1834), *B. semipunctatus* Kolyada, 2012, *Cryptoserphus aculeator* (Haliday, 1839), *C. flavipes* (Provancher, 1881), *Oxyserphus clypeatus* (Ashmead, 1893), *Tretoserphus laricis* (Haliday, 1839).

Keywords: fauna, Cryptoserphini, parasitic wasp, distribution

Introduction

The Taiwanese fauna of Proctotrupidae has been poorly surveyed, and currently, 18 species in 12 genera are recorded (Townes & Townes, 1981; Kolyada & Mostovski, 2017). The focus of the species was limited to only three genera—*Maaserphus*, *Nothoserphus*, and *Phoxoserphus*—in Taiwanese institutional collections (Lin, 1987, 1988; Abe, 2023). During my examination of the proctotrupids collection at the Taiwan Agricultural Research Institute (TARI), I identified several species not previously recorded from Taiwan. In this paper, I report them as new additions to the Taiwanese fauna, along with a checklist of the species.

Materials and methods

All specimens examined in this study are deposited in TARI. Photos were taken using an αMP-E65 mm macro lens mounted on a Sony 7R IV digital camera. Individual photos were stack-combined with Zerene Stacker and processed in Adobe Photoshop CC.

Morphological terms follow those of Townes & Townes (1981), He & Xu (2015), and the Hymenoptera Anatomy Ontology (Yoder et al., 2010).

Results

Family Proctotrupidae Latreille, 1802
Subfamily Proctotrupinae Latreille, 1802
Tribe Disogmini Kozlov, 1970

***Disogmus* Foerster, 1856**

Type species: *Proctotrupes areolator* Haliday, 1839

Remarks. This genus was recorded from Taiwan by Lin (1988), but no specific species was mentioned.

Tribe Cryptoserphini Kozlov, 1970

***Brachyserphus* Hellén, 1941**

Type species: *Codrus parvulus* Nees, 1834

Remarks. This genus was recorded from Taiwan by Lin (1988), but no specific species was mentioned. Distinguishing between species is challenging for most male samples (Choi et al., 2012).

***Brachyserphus abruptus* (Say, 1836), new record**
(Fig. 1)

Proctotrupes abruptus: Say, 1836: 278. Holotype, female; type locality: Indiana, USA.

Brachyserphus abruptus: Townes & Townes, 1981: 122-125 (transferred to *Brachyserphus*).

Specimen examined. 1 female, Meifeng, Nantou Hsien, 2150 m, 22 V 1982, L. Y. Chou; 4 females, same locality above, MT, X



1985, K. S. Lin; 1 female, same locality above, MT, VIII 1984, K. S. Lin & K. C. Chou; 1 female, same locality above, MT, VI 1984, K. S. Lin & K. C. Chou; 1 female, Anmashan, Taichung, 2275 m, 6-9 VII 1979, L. Y. Chou; 1 female, Tsuifeng, Nantou Hsien, 2300 m, MT, VIII 1984, K. S. Lin & K. C. Chou.

Diagnosis. Scrobe without longitudinal and oblique wrinkles; pronotal shoulder protrudes dorsally; pronotal corner in lateral with two pits; epicoxial carina on metapleuron is present. Metatibial spurs are not hooked. The punctate area in the anterior part of fifth tergite reaching 2/3 of its length and includes a row of hairs in the posterior part of the tergite. The ovipositor sheath is curved, not hooked, measuring 3.2 times the width laterally and 3.9 times the width dorsally.

Distribution. Brazil, Canada, Costa Rica, Mexico, Russia, USA (Kolyada 2016; Townes & Townes 1981). New record for Taiwan (Nantou County).

***Brachyserphus leleji* Kolyada, 2016, new record**

(Fig. 2)

Brachyserphus leleji: Kolyada, 2016: 75. Holotype, female; type locality: Iwate, Japan.

Specimen examined. 1 female, Tungpu, Nantou Hsien, 1200 m, 23-27 VII 1984, K. C. Chou & C. H. Yang; 1 female, same locality above, 18-23 XI 1981, T. Lin & W. S. Tang.

Diagnosis. Scrobe without longitudinal and oblique wrinkles; pronotal shoulder does not protrude dorsally; pronotal corner in lateral view with two pits; epicoxial carina on metapleuron is present. Metatibial spurs are not hooked. The punctate area in the anterior part of the fifth tergite reaches 2/3 of its length and includes a row of hairs in the posterior part of the tergite. The ovipositor sheath is hooked and strongly curved apically.

Distribution. Japan (Kolyada 2016). New record for Taiwan (Nantou County).

***Brachyserphus nudipleuralis* Kolyada, 1997, new record**

(Fig. 3)

Brachyserphus nudipleuralis: Kolyada, 1997: 5. Holotype, female; type locality: Primorskii krai, Russia.

Specimen examined. 1 female, Meifeng, Nantou Hsien, 2150 m, MT, X 1985, K. S. Lin; 1 female, same locality above, MT, VIII 1984, K. S. Lin & K. C. Chou; 2 females, Tsuifeng, Nantou Hsien, 2300 m, MT, VIII 1984, K. S. Lin & K. C. Chou; 1 female, same locality above, MT, X 1984, K. S. Lin; 1 female, same locality above, MT, X 1985, K. S. Lin; 1 female, Tayuling, Hualien Hsien, 2560 m, MT, 9-16 VI 1980, K. S. Lin & B. H. Chen; 3 females, Sungkang, Nantou Hsien, 2100 m, MT, XII 1985, K. S. Lin.

Diagnosis. Scrobe without longitudinal and oblique wrinkles; pronotal shoulder does not protrude dorsally; pronotal corner in lateral view with two pits; epicoxial carina on metapleuron is absent. Metatibial spurs are not hooked. The ovipositor sheath is curved, not hooked, measuring 0.55–0.60 times the length of the hind tibia.

Distribution. Japan, Russia (Kolyada 2016). New record for Taiwan (Nantou County and Hualien County).

***Brachyserphus parvulus* (Nees, 1834), new record**

(Fig. 4)

Codrus parvulus: Nees, 1834: 360. Holotype, female; type locality: Sickershausen, Germany,

Brachyserphus parvulus: Hellén, 1941: 42 (transferred to *Brachyserphus*).

Specimen examined. 1 female, Meifeng, Nantou Hsien, 2130 m, 2-4 VI 1980, L. Y. Chou & C. C. Chen; 3 females, Meifeng, Nantou Hsien, 2150 m, MT, VIII 1984, K. S. Lin & K. C. Chou; 3 females, Meifeng, Nantou Hsien, 2150 m, MT, X 1985, K. S. Lin; 3 females, same locality above, MT, VII 1984, K. S. Lin & K. C. Chou; 1 female, same data above, but date is VI 1984; 2 females, same data above, but date is X 1984; 1 female, Meifeng, Nantou Hsien, 2300 m, MT, VII 1984, K. S. Lin & K. C. Chou; 1 female, Sungkang, Nantou Hsien, 2100 m, MT, XI 1985, K. S. Lin; 1 female, same data above, but date is XII 1985; 2 females, same data above, but date is IX 1985; 1 female, same data above, but date is X 1985; 2 females, Tsuifeng, Nantou Hsien, 2300 m, MT, 1-3 VIII 1981, T. Lin & W. S. Tang; 1 female, same locality above, MT, 1-3 IX 1982, L. Y. Chou & K. C. Chou; 9 females, same locality above, MT, VIII 1984, K. S. Lin & K. C. Chou; 1 females, same locality above, MT, X 1984, K. S. Lin & K. C. Chou; 3 females, same locality above, MT, X 1985, K. S. Lin; 1 female, Tayuling, Hualien Hsien, 2560 m, MT, 10-16 VI 1980, K. S. Lin & B. H. Chen; 1 female, same locality above, 24-26 VI 1977, K. S. Lin.

Diagnosis. Scrobe without longitudinal and oblique wrinkles; pronotal shoulder does not protrude dorsally; pronotal corner in lateral view with two pits; epicoxial carina on metapleuron is present. Metatibial spurs are not hooked. The punctate area in the anterior part of the fifth tergite reaches 2/3 of its length and includes a row of hairs in the posterior part of the tergite. The ovipositor sheath is curved, not hooked, measuring 4.2–5.0 times the width laterally and 5.0–5.6 times the width dorsally.

Distribution. Austria, Canada, Iran, Ireland, Japan, Russia, South Korea, Sweden, UK, USA (Pschorn-Walcher, 1964; Townes & Townes, 1981; Zettel, 1991; Kolyada, 1997; Hedqvist, 2007; Choi et al., 2012; Izadizadeh et al., 2020). New record for Taiwan (Nantou County and Hualien County).



***Brachyserphus semipunctatus* Kolyada, 2012, new record**
(Fig. 5)

Brachyserphus semipunctatus: Choi et al., 2012: 243-244. Holotype, female; type locality: Primorskii krai, Russia.

Specimen examined. 2 females, Tsuifeng, Nantou Hsien, 2300 m, MT, IX 1984, K. S. Lin & K. C. Chou; 1 female, same locality above, MT, XI 1985, K. S. Lin; 1 female, same locality above, MT, X 1985, K. S. Lin; 1 female, same locality above, MT, 23-25 VI 1983, K. S. Lin & S. C. Lin; 2 females, same locality above, MT, 1-3 VIII 1981, T. Lin & W. S. Tang; 3 females, same locality above, MT, VIII 1984, K. S. Lin & K. C. Chou; 1 female, Meifeng, Nantou Hsien, 2150 m, MT, VI 1984, K. S. Lin & K. C. Chou; 1 female, same locality above, MT, 28-29 VIII 1981, L. Y. Chou & S. C. Lin; 1 female, same locality above, MT, 22 V 1982, L. Y. Chou; 1 female, same locality above, MT, VIII 1984, K. S. Lin & K. C. Chou; 1 female, Tayuling, Hualien Hsien, 2560 m, MT, 9-16 VI 1980, K. S. Lin & B. H. Chen; 1 female, Sungkang, Nantou Hsien, 2100 m, 6 VIII 1984, K. S. Lin.

Diagnosis. Scrobe without longitudinal and oblique wrinkles; pronotal shoulder does not protrude dorsally; pronotal corner in lateral view with two pits; epicoxial carina on metapleuron is present. Metatibial spurs are not hooked. The punctate area in the anterior part of the fifth tergite does not reach half of its length and does not include a row of hairs in the posterior part of the tergite. The ovipositor sheath is curved, not hooked.

Distribution. Japan, Korea, Russia, Ukraine (Choi et al. 2012; Kolyada 2016). New record for Taiwan (Nantou County and Hualien County).

***Cryptoserphus* Kieffer, 1907**

Type species: *Proctotrupes flavipes* Provancher, 1881

Remarks. This genus was recorded from Taiwan by Lin (1988), but no specific species was mentioned.

***Cryptoserphus aculeator* (Haliday, 1839), new record**
(Fig. 6)

Proctotrupes aculeator: Haliday, 1839: 14. Lectotype, female; data of type locality lacked.

Cryptoserphus aculeator: Kieffer, 1914: 39 (transferred to *Cryptoserphus*).

Specimen examined. 1 female, Meifeng, Nantou Hsien, 2130 m, 25 X-7 XI 1979; 1 female, same locality above, 29 VIII-10 IX 1979; 2 males, 1 female, same locality above, 10 V 1979, K. C. Chou; 1 female, Sungkang, Nantou Hsien, 2100 m, MT, XI 1985, K. S. Lin; 5 females, same locality above, MT, X 1984, K. S. Lin & K. C. Chou; 2 females, same locality above, MT, X 1985, K. S. Lin; 1 female, same locality above, MT, IX 1984, K. S. Lin & K. C. Chou; 1 female, same locality above, MT, IX 1985, K. S. Lin; 1 female, Anmashan, Taichung Hs., 2275 m, 6-9 VII 1979, L. Y. Chou; 1 male, Tayuling, Hualien Hsien, 2560 m, 9-16 VI 1980, K. S. Lin & B. H. Chen.

Diagnosis. Mandible short and thin, without subapical teeth. Notaulus is short, 0.5–1.0 times the width of the tegula. The dorsal part of the propodeum is longer than the posterior part, featuring a smooth area, measuring 1.4–1.6 times the width. The stigma is wider than the radial cell (2R1). Femora are fulvous. The antero-dorsal margin of tergite 1 has a long median groove. The antero-ventral part of sternite 1 bears about 50 hairs. Tergite 2 exhibits small punctures laterally, spaced about 2.0 times the diameter.

Distribution. Austria, China, Germany, Iran, Ireland, Italy, Japan, Java, Nepal, Philippines, Russia, Spain, South Korea, Sweden, UK (Fan & He 1991; Haliday 1839; Hellén 1941; Izadizadeh et al. 2016; Kieffer 1914; Park & Lee 2021; Pschorn-Walcher 1964; Townes & Townes 1981; Weidemann 1965). New record for Taiwan (Nantou County and Hualien County).

***Cryptoserphus flavipes* (Provancher, 1881), new record**
(Fig. 7)

Proctotrupes flavipes: Provancher, 1881: 264. Holotype, female; type locality: Quebec, Canada.

Cryptoserphus flavipes: Brues, 1919: 6 (transferred to *Cryptoserphus*).

Specimen examined. 1 male, Tsuifeng, Nantou Hsien, 2300 m, MT, 25-27 VI 1981, K. S. Lin & W. S. Tang; 1 female, same locality above, MT, XII 1985, K. S. Lin; 1 female, same data above, but date is XI 1985; 1 female, same data above, but date is X 1985.

Diagnosis. Mandible short and thin, with a subapical tooth; ventral margin of clypeus 3.3 times as long as its length. Pronotal shoulder does not project laterally; notaulus is short, 0.5–1.0 times the width of the tegula; dorsal part of the propodeum is longer than the posterior part, featuring a smooth area, measuring 1.4–1.6 times the width. Femora are fulvous. The antero-dorsal margin of tergite 1 has a long median groove, and the ovipositor sheath is 1.0 times as long as the hind tibia.

Distribution. Austria, Canada, China, Czechoslovakia, France, Germany, Japan, Russia, Sweden, UK, USA (He & Xu 2015; Kieffer 1914; Kolyada & Chemyreva 2019; Provancher 1881; Pschorn-Walcher 1964; Townes & Townes 1981). New record for Taiwan (Nantou County).

***Maaserphus* Lin, 1988**



Type species: *Maaserphus basalis* Lin, 1988

Remarks. The Taiwanese fauna of this genus was reviewed by Lin (1988).

***Maaserphus basalis* Lin, 1988**

Maaserphus basalis: Lin, 1988: 17-18. Holotype, female; type locality: Tsuifeng, Nantou County, Taiwan.

Distribution. Taiwan (Taichung County, Nantou County, Chiayi County) (Lin 1988).

***Maaserphus brevicaudus* Lin, 1988**

Maaserphus brevicaudus: Lin, 1988: 20. Holotype, female; type locality: Sungkang, Nantou County, Taiwan.

Distribution. Taiwan (Nantou County) (Lin 1988).

***Maaserphus fuscipes* Lin, 1988**

Maaserphus fuscipes: Lin, 1988: 19-20. Holotype, female; type locality: Sungkang, Nantou County, Taiwan.

Distribution. Taiwan (Nantou County) (Lin 1988).

***Maaserphus longicaudus* Lin, 1988**

Maaserphus longicaudus: Lin, 1988: 20. Holotype, female; type locality: Sungkang, Nantou County, Taiwan.

Distribution. Taiwan (Nantou County) (Lin 1988).

***Maaserphus striatus* Lin, 1988**

Maaserphus striatus: Lin, 1988: 18. Holotype, female; type locality: Sungkang, Nantou County, Taiwan.

Distribution. Taiwan (Ilan County, Nantou County) (Lin 1988).

Mischerphus Townes, 1981

Type species: *Cryptoserphus arcuator* Stelfox, 1950

Remarks. This genus was recorded from Taiwan by Lin (1988), but no specific species was mentioned. About 300 unidentified specimens belonging to this genus are deposited in TARI.

***Nothoserphus* Brues, 1940**

Type species: *Nothoserphus mirabilis* Brues, 1940

Remarks. The Taiwanese fauna of this genus was reviewed by Lin (1987).

***Nothoserphus admilabilis* Lin, 1987**

Nothoserphus admilabilis : Lin, 1987: 57. Holotype, female; type locality: Sungkang, Nantou County, Taiwan.

Distribution. Taiwan (Nantou County, Pingtung County) (Lin 1987).

***Nothoserphus aequalis* Townes, 1981**

Nothoserphus aequalis: Townes, 1981: 66. Holotype, female; type locality: Katumandu, Nepal.

Distribution. Nepal, Taiwan (Taoyuan County, Nantou County, Hualien County) (Lin 1987; Townes & Townes 1981).

***Nothoserphus debilis* Townes, 1981**

Nothoserphus debilis: Townes, 1981: 66-67. Holotype, male; type locality: Fenkihi, Chiayi County, Taiwan.

Distribution. China, Nepal, Taiwan (Nantou County) (He & Xu 2015; Lin 1987; Townes & Townes 1981).



***Nothoserphus epilachnae* (Pschorn-Walcher, 1958)**

Watanabeia epilachnae: Pschorn-Walcher, 1958: 728-729. Holotype, female; type locality: Lembang, Java.

Nothoserphus epilachnae: Townes & Townes, 1981: 67 (transferred to *Nothoserphus*).

Distribution. China, Java, Taiwan (Nantou County, Hualien County), Vietnam (He & Xu 2015; Lin 1987; Pschorn-Walcher 1958; Townes & Townes 1981).

***Nothoserphus fuscipes* Lin, 1987**

Nothoserphus fuscipes: Lin, 1987: 54-55. Holotype, female; type locality: Tsuifeng, Nantou County, Taiwan.

Distribution. Taiwan (Taichung County, Nantou County, Hualien County) (Lin 1987).

***Nothoserphus mirabilis* Brues, 1940**

Nothoserphus mirabilis: Brues, 1940: 264. Holotype, male; type locality: Taihorin, Chiayi County, Taiwan.

Distribution. China, India, Iran, Java, Nepal, Pakistan, Taiwan (Chiayi County, Taichung County, Nantou County, Hualien County, Pingtung County, Taitung County) (Bodlah *et al.* 2019; Hamid *et al.* 2020; Lin 1987; Pschorn-Walcher 1958; Townes & Townes 1981)

***Nothoserphus partitus* Lin, 1987**

Nothoserphus partitus: Lin, 1987: 53. Holotype, male; type locality: Tangpu, Nantou County, Taiwan.

Distribution. Taiwan (Nantou County) (Lin 1987).

***Nothoserphus townesi* Lin, 1987**

Nothoserphus townesi: Lin, 1987: 53-54. Holotype, female; type locality: Tangpu, Nantou County, Taiwan.

Distribution. Taiwan (Taichung County, Nantou County, Chiayi County) (Lin 1987).

***Oxyserphus* Masner, 1961**

Type species: *Proctotrupes maculipennis* Cameron, 1888

***Oxyserphus clypeatus* (Ashmead, 1893), new record
(Fig. 8)**

Proctotrupes clypeatus: Ashmead, 1893: 339. Holotype, female; type locality: New York, USA.

Oxyserphus clypeatus: Kolyada & Mostovski, 2017: 576 (transferred to *Oxyserphus*).

Specimen examined. 1 female, Sungkang, Nantou Hsien, 2100 m, MT, XI 1985, K. S. Lin; 1 female, Tsuifeng, Nantou Hsien, 2300 m, MT, VIII 1984, K. S. Lin & K. C. Chou; 1 male, Meifeng, Nantou Hsien, 2150 m, MT, 5-9 X 1980, C. C. Chen, & C. C. Chien.

Diagnosis. Mandible with a subapical tooth. Pronotul groove absent; ventro-lateral corner of pronotum without hairs; mesopleural hair band incomplete; metapleural smooth area present; ventro-lateral part of mesopleuron with hairs. Fore wing 2.6–3.6 mm, slightly to moderately tinged with dark brown, not yellow. Coxae dark brown. Stalk hidden; ovipositor sheath 0.60–0.85 times as long as hind tibia.

Distribution. Canada, Japan, Russia, USA.(Abe 2022; Kolyada & Chemyreva 2019; Townes & Townes 1981). New record for Taiwan (Nantou County).

***Phoxoserphus* Lin, 1988**

Type species: *Phoxoserphus chikoi* Lin, 1988

Remarks. All Taiwanese species have been reviewed by Abe (2023).

***Phoxoserphus chikoi* Lin, 1988**

Phoxoserphus chikoi: Lin, 1988: 22-23. Holotype, female; type locality: Sungkang, Nantou County, Taiwan.



Distribution. Japan, Taiwan (Miaoli County, Nantou County, Hualien County) (Abe, 2023).

***Phoxoserphus iyokpe* Abe, 2023**

Phoxoserphus iyokpe: Abe, 2023: 142-143. Holotype, female; type locality: Hokkaido, Japan.

Distribution. Japan, Taiwan (Nantou County) (Abe, 2023).

***Phoxoserphus vescus* Lin, 1988**

Phoxoserphus vescus: Lin, 1988: 21-22. Holotype, female; type locality: Tsuifeng, Nantou Hsien, Taiwan.

Distribution. Taiwan (Nantou County) (Abe, 2023).

***Trachyserphus* Kolyada, 2017**

Type species: *Hormoserphus segregatus* Townes, 1981.

***Trachyserphus segregatus* (Townes, 1981)**

Hormoserphus segregatus: Townes & Townes, 1981: 115-116. Holotype, female; type locality: Katumandu, Nepal.

Hormoserphus chinensis: He & Fan, 1991: 220-221.

Hormoserphus striatus: He & Xu, 2015: 203.

Trachyserphus segregatus: Kolyada & Mostovski, 2017: 578 (transferred to *Trachyserphus*).

Specimen examined. 1 male, Tsuifeng, Nantou Hsien, 2300 m, 16 VIII 1982, S. C. Lin & C. N. Lin; 1 female, same locality above, MT, IX 1984, K. S. Lin & K. C. Chou; 2 females, same locality above, MT, VII 1984, K. S. Lin & K. C. Chou; 1 male, Alishan, Chiayi Hsien, 2400 m, 17-20 1982, K. C. Chou & C. C. Pan; 2 male, Tungpu, Nantou Hsien, 1200 m, 28 IV-2 V 1981, T. Lin & C. J. Lee; 1 female, Meifeng, Nantou Hsien, 2150 m, MT, VII 1984, K. S. Lin & K. C. Chou; 1 female, same locality above, 7-9 V 1981, K. S. Lin & S. C. Lin; 1 female, Arisan, 2-23 X 1918, J. Sonan & M. Yoshino.

Diagnosis. The area between antennal sockets is strongly convex in dorsal view, and the dorsal part of the occipital carina is developed. The longer spur of the hind tibia measures 0.7 times the length of the basitarsus. The ovipositor sheath is short, measuring 0.3 times the length of the hind tibia.

Distribution. China, Nepal, Taiwan (Taichung County, Nantou County, Chiayi County), Vietnam (Kolyada & Mostovski 2017).

Remarks. The record of this species from Taiwan was based on the collection of the Canadian National Collection of Insects in Ottawa, Canada (CNCI) (Kolyada & Mostovski 2017). Additional specimens were recognized in TARI

***Tretoserphus* Townes, 1981**

Type species: *Proctotrupes larisis* Haliday, 1839

Remarks. This paper reports the genus as newly recorded in Taiwan.

***Tretoserphus laricis* (Haliday, 1839), new record**
(Fig. 9)

Proctotrupes laricis: Haliday, 1839: 14. Holotype, female; type locality: England, UK.

Tretoserphus laricis: Townes, 1981: 70-73 (transferred to *Tretoserphus*).

Specimen examined. 1 male, Tsuifeng, Nantou Hsien, 2300 m, 20 IV 1983, K. C. Chou & S. P. Huang.

Diagnosis. Lateral part of pronotal shoulder is developed and weakly projecting. The scrobe is smooth, and the carina connecting the metapleural smooth area to the anterior margin of the propodeum is distinct. The first thyridium is 2.6-4.0 times as long as wide. The ovipositor sheath is smooth and 0.6 times as long as the hind tibia.

Distribution. Canada, China, Iran, Japan, Russia, South Korea, Sweden, UK, USA (Hamid *et al.* 2020; Kolyada & Chemyreva 2019; Pschorn-Walcher 1964; Townes & Townes 1981). New record for Taiwan (Nantou County).

Tribe Proctotrupini Latreille, 1802

***Exallonyx* Kieffer, 1904**

Type species: *Exallonyx formicarius* Kieffer, 1904

***Exallonyx chiuuae* Townes, 1981**

Exallonyx chiuuae: Townes & Townes, 1981: 301-302. Holotype, male; type locality: Kuanhsi, Sinchu, Taiwan.

Distribution. Taiwan (Hsinchu County, Nantou County) (Townes & Townes 1981).

Remarks. This species was described by Townes & Townes (1981), and the type series is deposited in CNCI..

***Phaenoserphus* Kieffer, 1908**

Type species: *Proctotrupes viator* Haliday, 1839

Remarks. This genus was recorded from Taiwan by Lin (1988), but no specific species was mentioned.

***Phaneroserphus* Pschorn-Walcher, 1958**

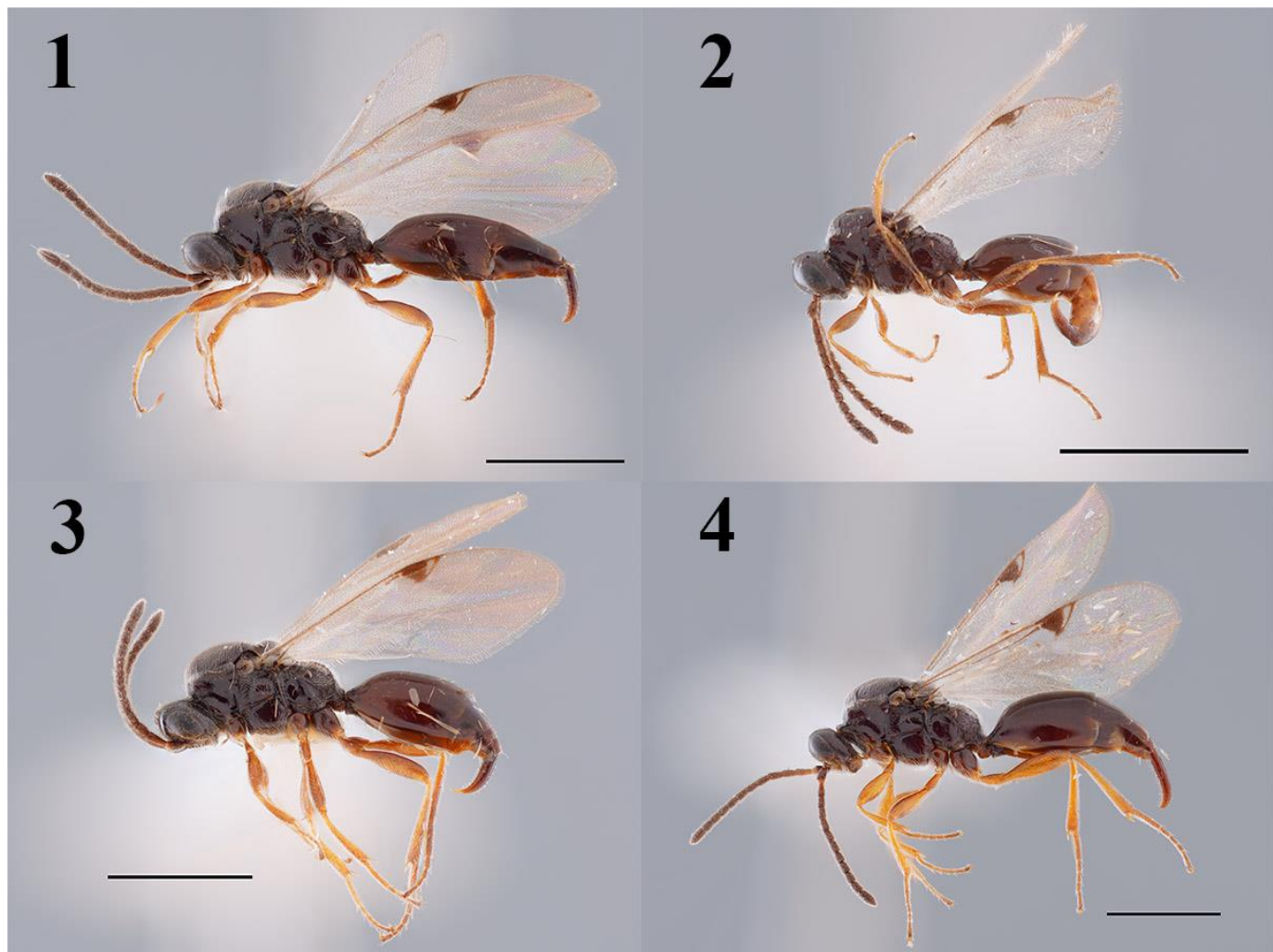
Type species: *Proctotrupes calar* Haliday, 1839

Remarks. This genus was recorded from Taiwan by Lin (1988), but no specific species was mentioned.

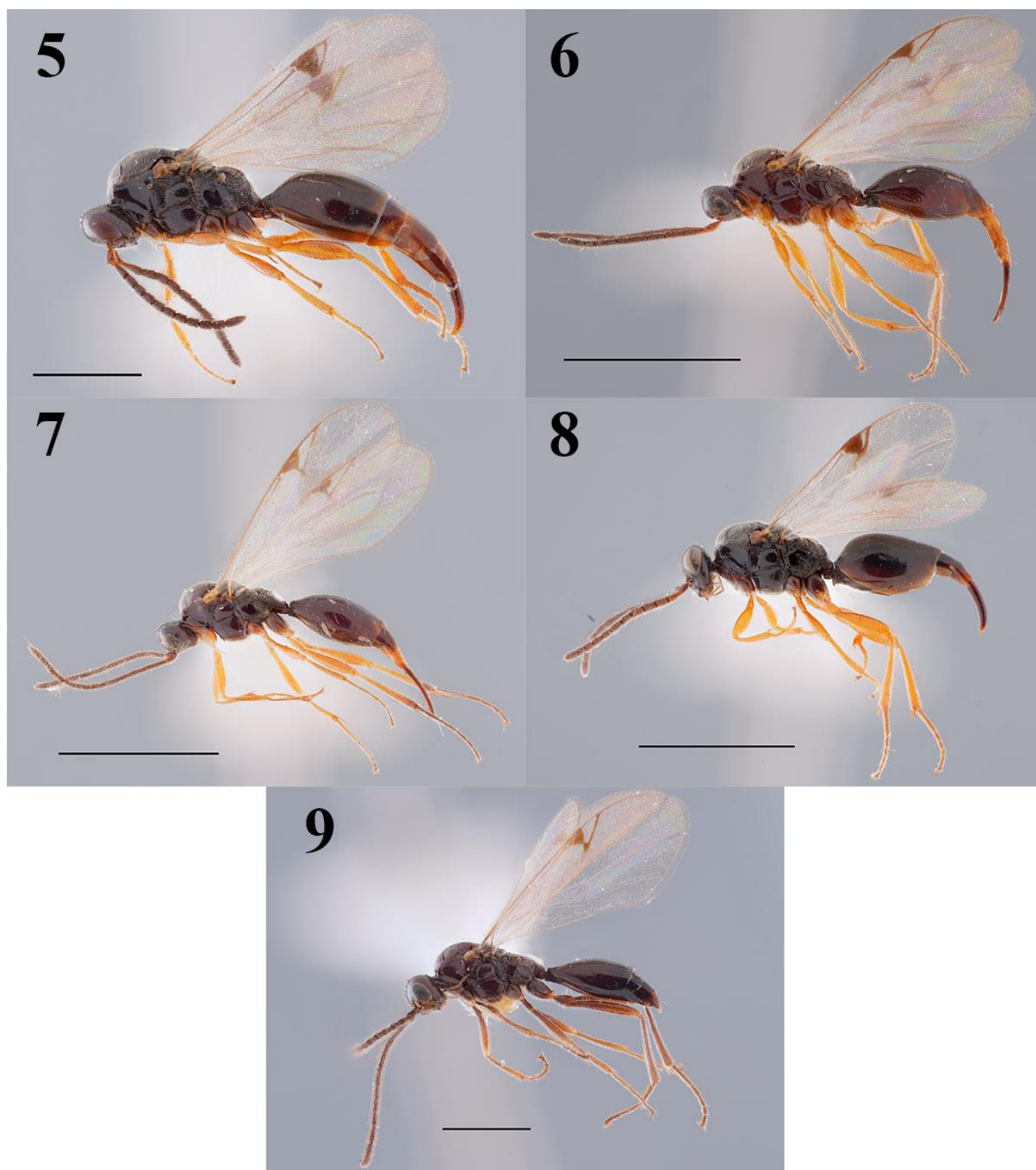
***Proctotrupes* Latreille, 1802**

Type species: *Proctotrupes brachypterus* Latreille, 1802

Remarks. This genus was recorded from Taiwan by Lin (1988), but no specific species was mentioned.



Figures 1–4. Lateral habitus of Taiwanese Proctotrupidae. 1: *Brachyserphus abruptus*; 2: *B. leleji*; 3: *B. nudipleuralis*; 4: *B. parvulus*. Scale bars: 1 mm



Figures 5–9. Lateral habitus of Taiwanese Proctotrupidae. 5: *B. semipunctatus*; 6: *Cryptoserphus aculeator*; 7: *C. flavipes*; 8: *Oxyserphus clypeatus*; 9: *Tretoserphus laricis*. Scale bars: 6-8 = 2 mm; 9 = 1 mm.

Discussion

Approximately 800 specimens were examined from TARI's collection. Only 117 specimens could be identified and were recorded in this study. Intensive examination of TARI's collection is needed for Disogmini, Proctotrupini, and the remaining Cryptoserphini. In He & Xu (2015), 267 species were newly described in Mainland China. Further research will be required for the proctotrupid fauna in Taiwan.

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臺灣產細蜂科名錄 (膜翅目：細蜂總科)與九種臺灣新紀錄種

阿部 純大

日本九州大學大學院生物資源環境科學府昆蟲學研究室

通訊作者：ff.my.j.r@gmail.com

摘要：本研究提供臺灣產細蜂科名錄，包含9種臺灣新紀錄：*Brachyserphus abruptus* (Say, 1836)、*B. leleji* Kolyada, 2016、*B. nudipleuralis* Kolyada, 1997、*B. parvuunclus* (Nees, 1834)、*B. semipunctatus* (Haliday, 1839)、*C. flavipes* (Provancher, 1881)、



Oxyserphus clypeatus (Ashmead, 1893)與 *Tretoserphus laricis* (Haliday, 1839)。

關鍵詞：動物相、Cryptoserphini、寄生蜂、分佈



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New Records of Ectoparasitic Flies (Diptera: Streblidae, Nycteribiidae) Associated with Bats (Mammalia: Chiroptera) from Samar Island, Philippines

ACE KEVIN S. AMARGA^{1, 2, 3}

¹Biodiversity Program, Taiwan International Graduate Program, Biodiversity Research Center, Academia Sinica, Nangang District, Taipei 11529, Taiwan. Email: ace_amarga061@yahoo.com

²School of Life Science, National Taiwan Normal University- Gongguan Campus, Wenshan District, Taipei 11677, Taiwan

³International Union for Conservation of Nature Species Survival Commission (IUCN SSC) Parasite Specialist Group

Abstract. This paper reports additional island records of bat flies from the genera *Brachytarsina*, *Leptocyclopodia*, and *Megastrebla* on Samar Island, Philippines. Furthermore, this documentation represents the first published account of streblid bat flies in Samar.

Keywords: Chiroptera, ectoparasites, Nycteribiidae, Streblidae

Ectoparasitic insects associated with bats in Samar are poorly documented, especially bat flies (Hippoboscoidea). To date, only two species of bat flies have been recorded in Samar, both of which are nycteribiid species (Baltazar, 1990). In this paper, we present additional new island records of bat flies, along with the first published account of the family Streblidae on Samar Island. From June 26 to 30, 2017, a rapid biodiversity assessment was conducted in Catubig Watershed, Barangay San Isidro, Las Navas municipality, Northern Samar province, Samar Island, Philippines. During the fieldwork, nine species of bats (Chiroptera) were recorded, belonging to nine genera representing the families Hipposideridae, Miniopteridae, Pteropodidae, and Rhinolophidae. Ectoparasitic arthropods were collected from the captured bats and carefully removed using fine-tipped forceps. Bat fly specimens were preserved in 95% ethanol and examined using a Leica S9D stereomicroscope. Voucher specimens will be deposited at the National Taiwan Normal University. The collected bat flies are as follows:

Family Streblidae Kolenati, 1863

Brachytarsina wernerii (Jobling, 1951)

Material examined. PHILIPPINES: SAMAR: On *Hipposideros diadema*: 2♀♀, Northern Samar, Catarman, Las Navas municipality, Barangay San Isidro, Catubig Watershed, 27-29.VI.2017, coll. AK Amarga.

Previous Philippine records: Batan, Bohol, Luzon, Marinduque, Mindanao, Mindoro (Cuy, 1980a; Baltazar, 1990; Alvarez et al. 2016, Amarga & Phelps, 2021; Amarga & Amarga, 2023). **New record for Samar.**

Megastrebla parvior Maa, 1962 (Fig. 1A)

Material examined. PHILIPPINES: SAMAR: On *Eonycteris spelaea*: 1♀, Northern Samar, Catarman, Las Navas municipality, Barangay San Isidro, Catubig Watershed, 27-29.VI.2017, coll. AK Amarga.

Previous Philippine records: Balabac, Batan, Cebu, Leyte, Luzon, Marinduque, Mindanao, Mindoro, Negros, Palawan, Samal, Siargao (Cuy, 1980a; Baltazar, 1990; Alvarez et al., 2016; Amarga et al., 2017; Amarga & Phelps, 2021; Amarga & Hastriter, 2022; Amarga & Amarga, 2023). **New record for Samar.**

Family Nycteribiidae Samouelle, 1819

Leptocyclopodia ferrarii mabuhai Maa, 1975 (Fig. 1B)

Material examined. PHILIPPINES: SAMAR: On *Cynopterus luzoniensis*: 5♂♂, 2♀♀, Northern Samar, Catarman, Las Navas municipality, Barangay San Isidro, Catubig Watershed, 27-29.VI.2017, coll. AK Amarga.

Previous Philippine records: Camiguin, Cebu, Guimaras, Leyte, Luzon, Mindanao, Mindoro, Negros, Panay (Cuy, 198b; Baltazar, 1990; Alvarez et al., 2016; Amarga & Hastriter, 2023). **New record for Samar.**

Leptocyclopodia simulans (Theodor, 1959)

Material examined. PHILIPPINES: SAMAR: On *Ptenochirus jagori*: 2♂♂, 3♀♀, Northern Samar, Catarman, Las Navas municipality, Barangay San Isidro, Catubig Watershed, 27-29.VI.2017, coll. AK Amarga.

Previous Philippine records: Batan, Bohol, Camiguin, Cebu, Leyte, Luzon, Mindanao, Mindoro, Negros, Tablas (Cuy, 1980b; Baltazar, 1990; Alvarez et al. 2016; Amarga & Fornesa, 2020; Amarga & Hastriter, 2023; Amarga & Amarga, 2023). **New record for Samar.**

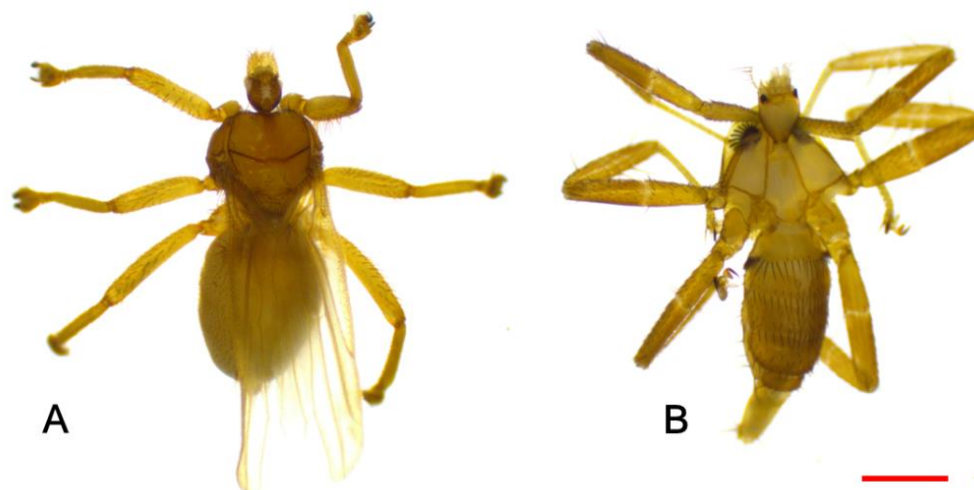


Figure 1. Representative bat flies occurring on Samar Island: (A) *Megastrebla parvior* (♀, dorsal); (B) *Leptocyclopodia ferrarii mabuhai* (♂, dorsal). Scale bar = 1mm.

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菲律賓薩馬島與蝙蝠（哺乳綱：翼手目）相關的外寄生蠅（雙翅目：蝙蝠蠅科、蛛蠅科）新紀錄

艾斯^{1,2,3}

¹中央研究院生物多樣性中心 生物多樣性臺灣國際研究生博士學位學程 11529 臺北市南港區
E-mail: ace_amarga061@yahoo.com

²國立臺灣師範大學生命科學專業學院 11677 臺北市文山區

³國際自然保護聯盟物種存續委員會 (IUCN SSC) 寄生蟲專家組

摘要：本文報導產自菲律賓薩馬島(Samar Island) 的 *Brachytarsina*, *Leptocyclopodia*, 和 *Megastrebla* 屬外寄生蠅的新紀錄，此外提供薩馬島首次關於蝙蝠蠅科的紀錄。

關鍵詞：翼手目、體外寄生蟲、蛛蠅科、蝙蝠蠅科

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來稿請寄送：taisocinh@gmail.com